

IS 11086 : 2013

(Reaffirmed 2018)

भारतीय मानक

स्वचल अनुप्रयोग के लिए स्पीडोमीटर/ओडोमीटर
पद्धति — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard

SPEEDOMETER/ODOMETER SYSTEMS FOR
AUTOMOTIVE APPLICATION — SPECIFICATION
(*First Revision*)

ICS 43.040.30

© BIS 2013

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 2013

Price Group 5

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Electrical Equipments and Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1984. In this revised standard speedometers of electronics types have also been included.

Speedometers in automobiles are used as instruments to indicate the rate of distance travelled per unit time. This standard is intended to cover the electronic speedometers as well as mechanical type of speedometers using a rotating magnet.

This standard has also been brought out with a view to establish an acceptable level of quality and performance and also to bring about a degree of interchangeability in these units.

In formulating this standard, assistance has been derived from the following standard:

DIN 75532-1:1976 Transmission of rotary motion; Types of connection to gears,
Intermediate gears, flexible drive shafts and equipments

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SPEEDOMETER/ODOMETER SYSTEMS FOR AUTOMOTIVE APPLICATION — SPECIFICATION (*First Revision*)

1 SCOPE

This standard covers the general designs, performance characteristics and test procedures for mechanical and electronic type of speedometers suitable for automotive vehicles covered in IS 14272 : 2010 'Automotive vehicles — Types — Terminology (*first revision*)'.

2 REFERENCES

The following standards contain provisions, which, through references in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS/ISO No.</i>	<i>Title</i>
269 : 1989	Specification for 33 grade ordinary Portland cement (<i>fourth revision</i>)
4905 : 1968	Method for random sampling
9000	Basic environmental testing procedures for electronic and electrical items
(Part 2/Sec 1 to 4) : 1977	Cold test
(Part 3/Sec 1 to 5) : 1977	Dry heat test
(Part 5/Sec 1 and 2) : 1981	Damp heat (Cyclic) test
(Part 14/Sec 1 to 3) : 1988	Test N : Change of temperature (<i>first revision</i>)
(Part 16) : 1983	Driving rain test
11827 : 2008	Automotive vehicles — Calibration of speedometer — Method of evaluation (<i>second revision</i>)
ISO 7637-2 : 2004	Road vehicles — Electrical disturbances from conduction and coupling : Part 2 Electrical transient conduction along supply lines only
ISO 7637-3 : 2007	Road vehicles — Electrical disturbances from conduction and coupling : Part 3 Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines

3 TERMINOLOGY

For the purpose of this standard, the definition given in IS 11827 and the following shall apply.

3.1 Odometer (Distance Indicator) — A device, which indicates the accumulated total distance travelled by the vehicle. The recommended unit is kilometres.

3.2 Effective Range — That portion of the scale over which the instrument purports to comply with specified limits of accuracy.

3.3 Sweep — The included angle between the minimum and maximum of the scale.

3.4 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of speedometer.

3.5 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

3.6 Mechanical Type — The system to move the indicator of the meter by converting the rotation of the flexible shaft to its input socket.

3.7 Electronic Type — The system to drive the indicating apparatus by converting the electronic signal from vehicle speed sensor by using electronic circuit.

4 DESIGN AND CONSTRUCTION

4.1 The instrument shall consist of an odometer and speedometer.

4.1.1 Mechanical Type

The instrument is driven by flexible shaft.

4.1.2 Electronic Type

Suitable electronic interface circuiting to convert a speed signal from a vehicle speed sensor or from an Electronic Control Unit (ECU) to drive display apparatus.

4.2 Dial Facia

The printing details on the dial such as style of lettering printing, thickness of graduation, consumer's monogram, symbol or writing and colour of printing shall be according to the requirements of the purchaser. However marked numerical values and graduations in case of mechanical type and display of numerals in case of electronic type shall be as per IS 11827.

4.3 In mechanical type bearing block threading for input shaft connection shall be M12 X1, M18X1.5 for four wheeler snap on type with OD 16 mm or as specified by the purchaser.

4.4 In electronics type the nominal operating voltage of speedometer shall be as agreed to between the supplier and the purchaser.

4.5 The movement of the pointer of the speedometer shall be clockwise. The pointer vibration must not be more than ± 2 percent of the full scale value when the speed is increased from 20 km/h to 80 percent of the full scale value of speed indication.

4.6 Illumination

Normally, the instrument shall be equipped with illumination. The instrument may be supplied without illumination, if the purchaser specifically requires so.

4.7 General Behaviour of Pointer for Electronic Speedometer

4.7.1 Speed Indication of Voltage Variation

The indication shall not change by more than ± 1 percent of full scale indication from the reading determined. below:

12 V System	24 V System
9 V-16 V	18 V-32 V

4.7.2 The speed indication shall be shown even when the input shaft is rotated in reverse direction.

4.7.3 The odometer should advance the counter even when the input shaft is rotated in reverse direction.

5 DIMENSIONS

5.1 The preferred outside diameter of the case or housing shall be 48, 60, 73, 80, 85, 100 or 140 mm. All other dimensions including that of the mounting accessories shall be as specified by the purchaser. The illustrations for input shaft connections for mechanical type speedometer are given in Fig. 1(a), Fig. 1(b), Fig. 1(c), Fig. 1(d) and Fig. 1(e). Fitment dimension of a speedometer with odometer is given in Fig. 2.

5.2 The dimensions of non-circular type of speedometers shall be as specified by the purchaser.

6 TESTS FOR MECHANICAL AND ELECTRONIC TYPE

6.1 Classifications of Tests

6.1.1 Type Tests

The following shall constitute type tests:

- Visual examination (*see 6.2*);
- Accuracy test (*see 6.3*);
- Hysteresis test (*see 6.4*);
- Endurance test (*see 6.5*);
- Vibration test (*see 6.6*);
- Dry heat test (*see 6.7*);
- Damp heat cycling test (*see 6.8*);
- Cold test (*see 6.9*);
- Rapid change of temperature test (*see 6.10*);
- Driving rain test (*see 6.11*);
- Dust test (*see 6.12*);
- Electronic speedometer exclusive tests (*see 7*); and
- Sensor unit (Electronics Speedometer) tests (*see 8*).

6.1.1.1 Criteria for approval

Twelve samples shall be submitted for testing together with the relevant data. The samples shall be tested according to the test schedule given in Annex A. The testing authority shall issue a conformity certificate, if the speedometers are found to comply with the requirements of tests.

6.1.1.2 In case of failure in one or more type tests, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to test(s) in which failure occurred. If no failure occurs in repeat test(s), the tests shall be considered to have been satisfied.

6.1.2 Acceptance Tests

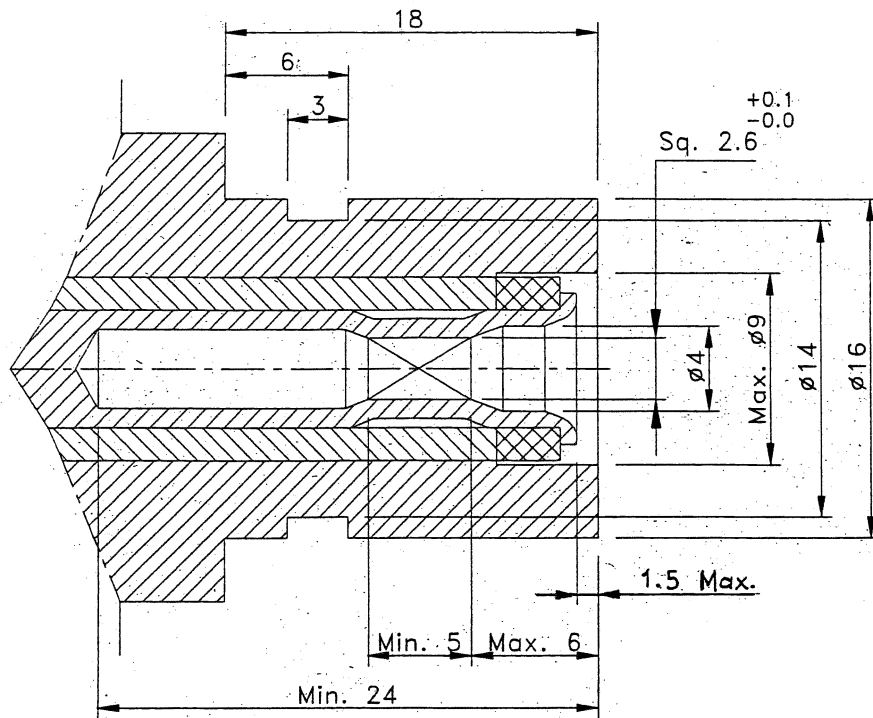
The following shall constitute acceptance tests :

- Visual examination (*see 6.2*); and
- Accuracy test (*see 6.3*);

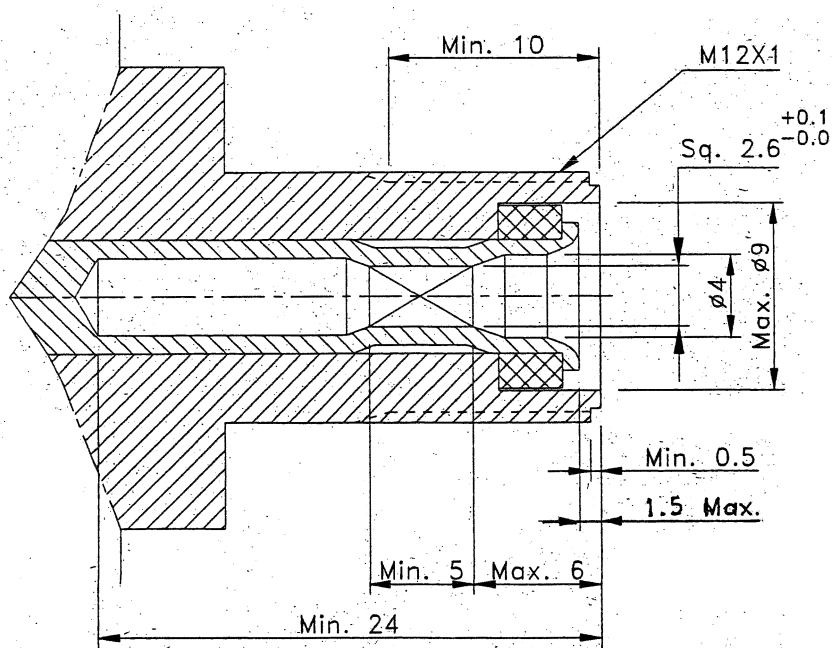
6.1.2.1 The number of samples for acceptance tests shall be as specified by the purchaser. However, a recommended sampling plan is given in Annex B.

6.2 Visual Examination

The external components and the dial shall be visually examined for surface defects. The dial characteristics shall be as specified by the purchaser.

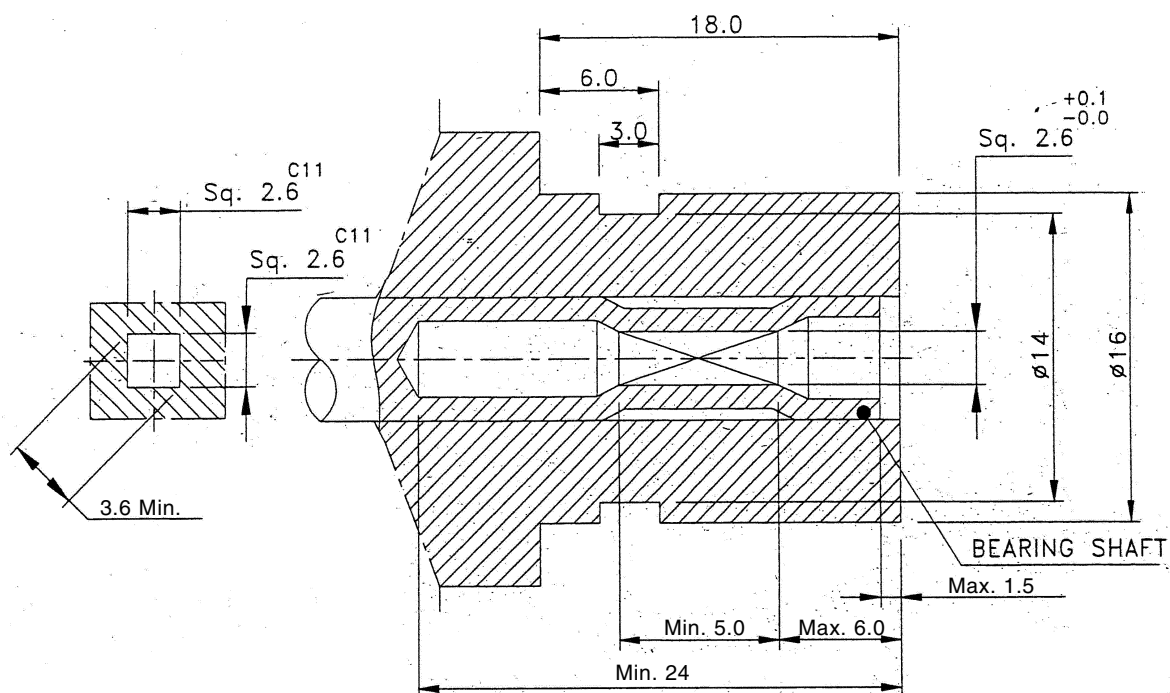


1a Illustration of Typical Input Shaft Connection

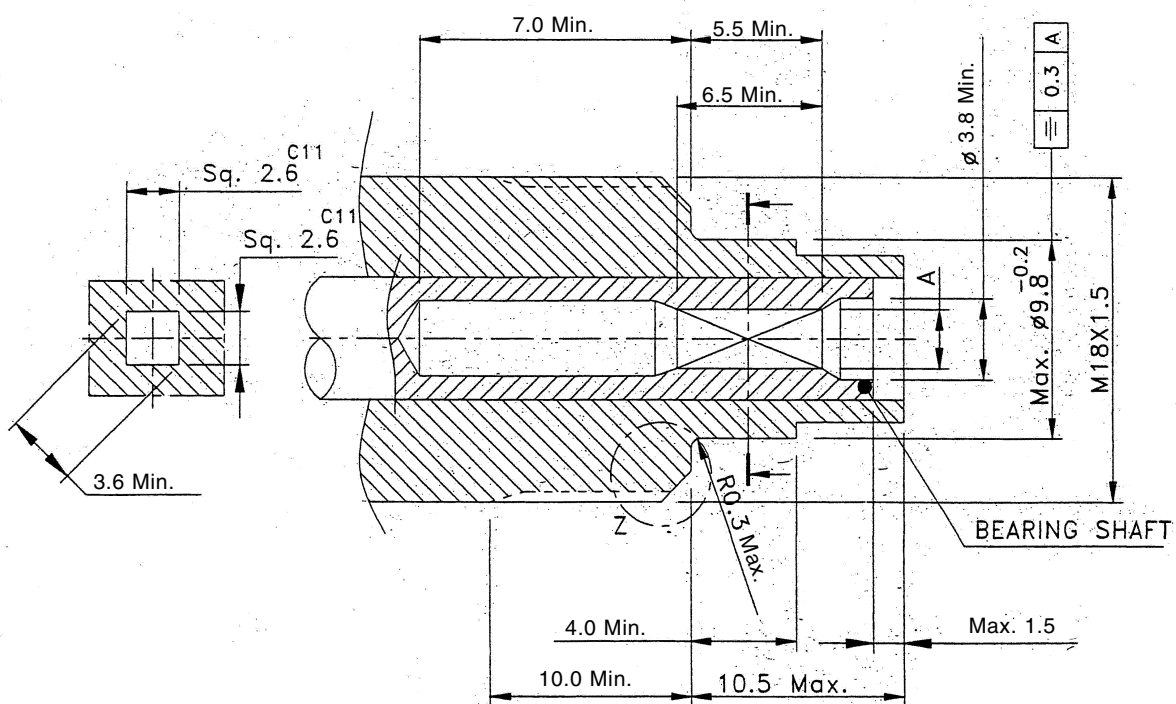


1b Illustration of Typical Input Shaft Connection

FIG. 1 ILLUSTRATIONS OF TYPICAL INPUT SHAFT CONNECTION — (Continued)

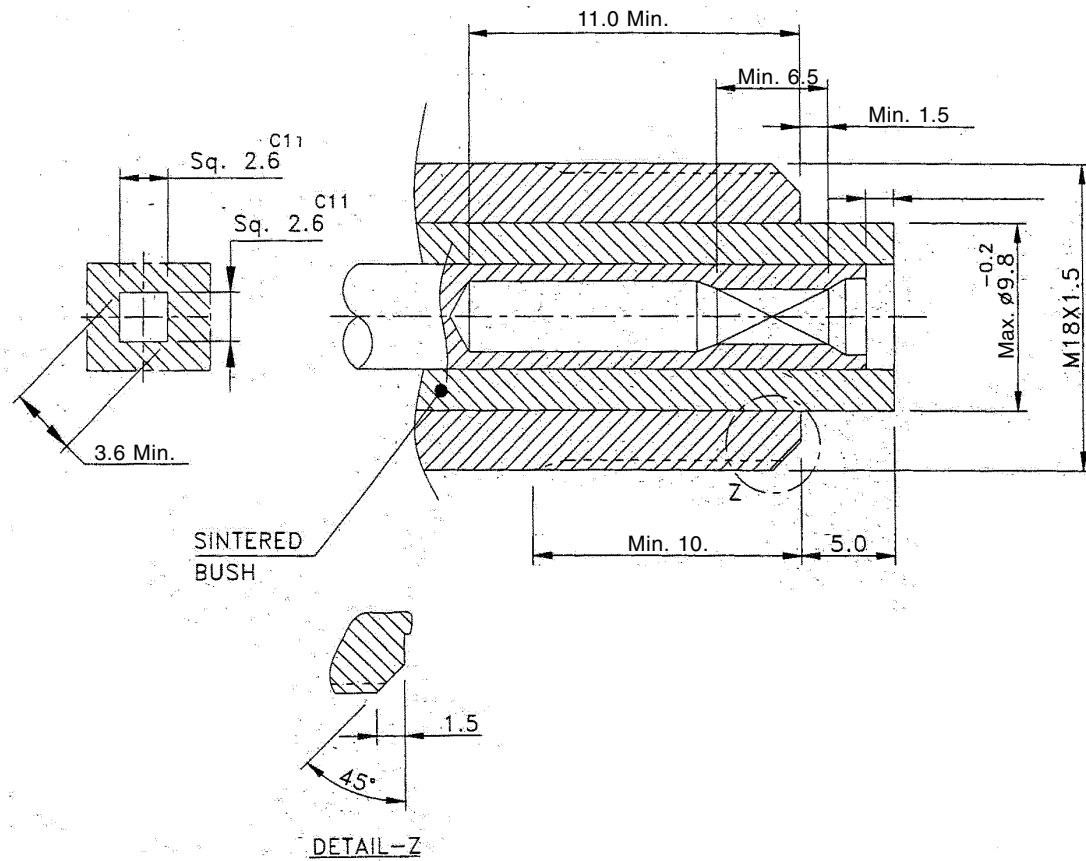


1c Illustration of Typical Input Shaft Connection

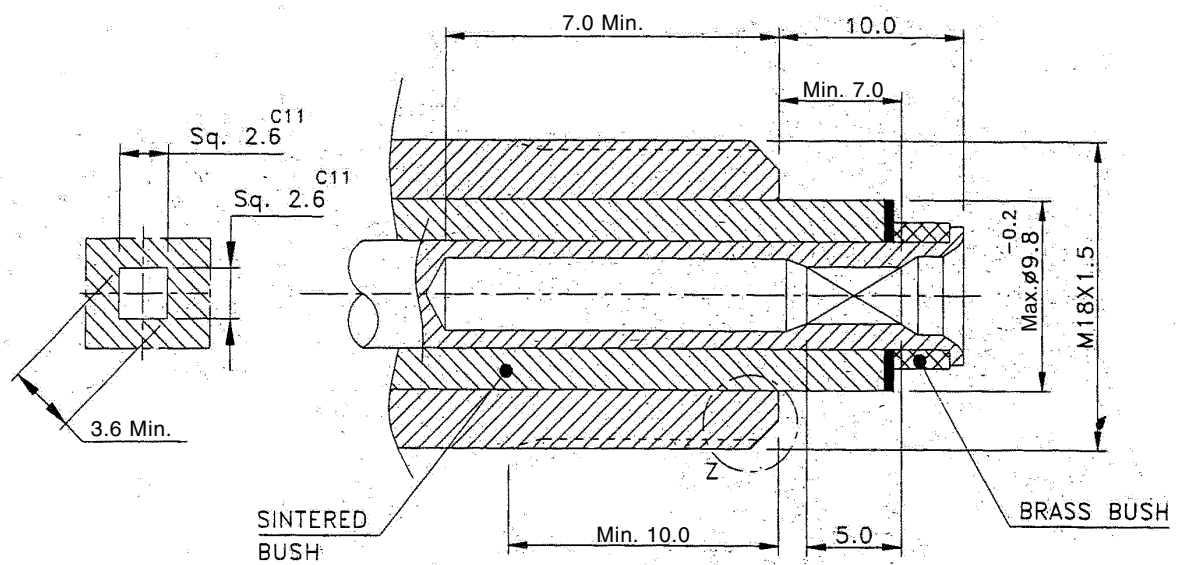


1d Illustration of Typical Input Shaft Connection

FIG. 1 ILLUSTRATIONS OF TYPICAL INPUT SHAFT CONNECTION — (Continued)



1e Illustration of Typical Input Shaft Connection



1f Illustrations of Typical Input Shaft Connection

FIG. 1 ILLUSTRATIONS OF TYPICAL INPUT SHAFT CONNECTION

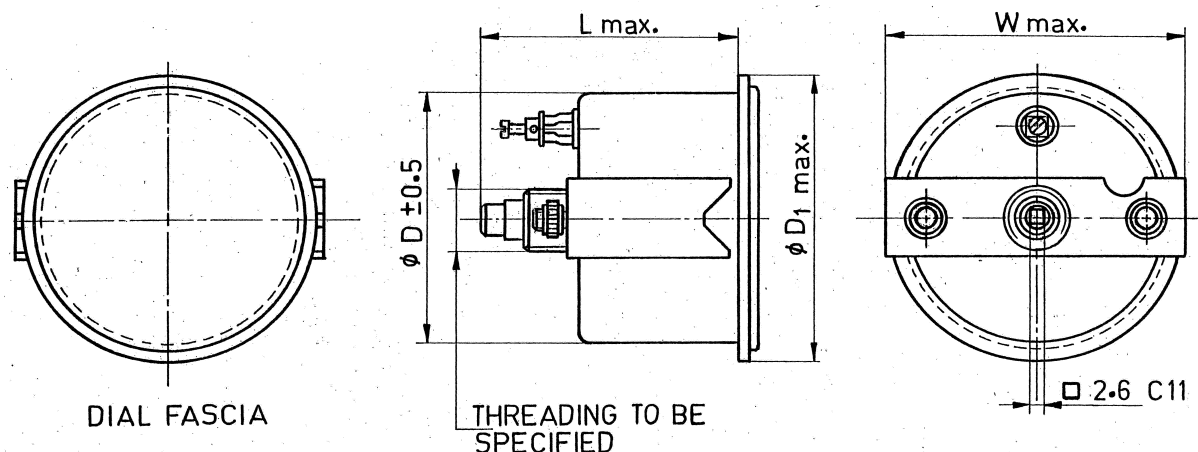


FIG. 2 FITMENT DIMENSIONS OF A TYPICAL SPEEDOMETER WITH ODOMETER

6.3 Accuracy Test

6.3.1 Tolerance on Indication

The permissible tolerance on the observed value on speedometer at $25 \pm 5^\circ\text{C}$ shall be 0 to +4 percent of the full scale value for the effective range.

6.3.1.1 Under standard conditions the tolerance on the observed value of the odometer reading shall be ± 2 percent of actual value.

6.3.2 Pointer Resting

When the drive shaft of the instrument is not rotating, the pointer shall rest on the stop pin or at zero position or as agreed to between the manufacturer and the purchaser.

6.3.3 Pointer Stability

The oscillation of the pointer shall be not more than ± 2 percent of the full scale value on either side of any particular indication within the effective range. However, for an instrument having the sweep less than 180° , the permissible oscillation of the pointer shall be not more than ± 3 percent of the full scale value within the effective range. When there is a change in the input above 30 km/h, the oscillation of the pointer shall be permissible for a maximum period of 3s before indicating the final reading.

6.3.4 Sensitivity

The pointer shall return to zero when moved from that position by an impact or when the drive stops rotating.

6.3.5 Damping

The pointer shall respond to any change in input within 3s.

6.3.6 Counter Alignment (Odometer Alignment)

In mechanical type the alignment of the marked numerical values while at rest, shall be within 0.75 mm

of the true alignment. Misalignment of marked numerical values shall not exceed 0.75 mm except when they are moving. The marked numerical values shall not be obscured by the window aperture and no part of the preceding or succeeding marked numerical values shall be visible when viewed from an average driver's eye line, except when the marked numerical values are moving.

6.4 Hysteresis Test

When the speedometer is tested for increasing and decreasing input signals, the indication of the pointer for any particular values on decreasing signal may be different from that of the corresponding indication on increasing signal. The two reading shall be within the tolerance specified in 6.3.1.

6.5 Endurance Test

The speedometer shall be operated continuously at 70 percent of its full range speed till the odometer reads 100 000 km. The instrument shall be checked for accuracy as specified in 6.3.1 at regular intervals of every 10 000 km indicated by the odometer.

6.5.1 After the test, the variation in the observed value from the initial value shall not exceed +4 percent of the full scale value.

6.6 Vibration Test

6.6.1 The speedometer after being rigidly mounted on a suitable vibrating machine constructed to produce a simple harmonic motion shall be subjected to vibration (a total lift of 0.7 mm) through a frequency range of 10-55-10 Hz in a period of 1 min. With continuously varying frequencies the vibration shall be applied for not less than 1h in each of the three major areas of the speedometer. At the end of the vibration test the speedometer shall be examined for any evidence of

damage and shall be subjected to accuracy test (see 6.3.1). The samples after the test shall not show loosening of parts, cracks, etc.

6.7 Dry Heat Test

The dry heat test shall be carried out according to IS 9000 (Part 3/Sec 1 to 5) with a gradual change of temperature under the following conditions:

Temperature : $70 \pm 2^\circ\text{C}$
Duration of exposure : 4 h

6.7.1 After this test, while the speedometer is still at the high temperature, the speedometer shall satisfy requirements specified in 6.3.1. The sample after the test should not indicate any discolouration, moisture below the lens, etc.

6.8 Damp Heat Cycling Test

The damp heat (cycling) test shall be carried out according to IS 9000 (Part 5/Sec 1 and 2) not followed by exposure to cold. The number of conditioning cycles shall be 2.

6.8.1 After this test, the speedometer shall satisfy requirements specified in 6.3.1. The sample after the test should not indicate any discolouration, moisture below the lens, etc.

6.9 Cold Test

The cold test shall be carried out as in IS 9000 (Part 2/Sec 1 to 4) with a gradual change in temperature under the following condition:

Temperature : $-10 \pm 3^\circ\text{C}$
Duration of exposure : 2 h

6.9.1 After this test, while the speedometer is still at the low temperature, the variation observed from the initial value shall not exceed 6 percent of the full scale value when tested in accordance with 6.3.1. The sample after the test should not indicate any discolouration, moisture below the lens, etc.

6.10 Rapid Change of Temperature Test

Rapid change of temperature test shall be carried out as per IS 9000 (Part 14/Sec 1 to 3). The speedometer shall be exposed to the following conditions:

Cold temperature, *Min* : $-10 \pm 3^\circ\text{C}$
Hot temperature, *Max* : $+70 \pm 2^\circ\text{C}$
Number of cycles : 2
Duration : 30 min

6.10.1 After this test, the speedometer shall satisfy requirements specified in 6.3.1. The sample after the test should not indicate any discolouration, moisture below the lens, etc.

6.11 Driving Rain Test

The speedometer shall be subjected to driving rain test as per IS 9000 (Part 16) exposing only the front parts for 30 min. This test is not applicable for speedometers meant for fitting in cabins.

6.11.1 After this test, the speedometer shall satisfy requirements specified in 6.3.1. The sample after the test should not indicate any discolouration, moisture below the lens, etc.

6.12 Dust Test

This test is intended to determine satisfactory performance of speedometer/odometer systems. The speedometer/odometer system, with drain hole, if any, closed shall be mounted in its normal operating position, 150 mm from the wall in a box measuring 900 mm in all directions, containing 5 kg of fine powdered cement conforming to IS 269. At intervals of 15 min, this dust shall be agitated by compressed air or fan blower by projecting blasts of air for a 2s period in a downward direction into the dust in such a way that the dust shall be completely and uniformly diffused throughout the entire cube. The dust shall then be allowed to settle. This test shall be continued for 5 h.

After the test there shall be no ingress of dust inside the meter. Indication error shall also be within permissible tolerance as specified in 6.3.1.

7 ELECTRONIC SPEEDOMETER/ODOMETER EXCLUSIVE TESTS

7.0 The measurements of electronic type speedometers/odometer are carried out by connecting vehicle speed sensor test voltages of electronic type speedometers shall be as given in the table below:

<i>Nominal Voltage</i>	<i>Test Voltage</i>
12	13.5
24	27

7.1 Temperature and Voltage Characteristic Test

Drive speedometer so as the indicating speed of specimen speedometer to be 60 km/h at the environmental temperature of $20 \pm 2^\circ\text{C}$. Change the temperature in the range of -20°C to $+60^\circ\text{C}$ for the speedometer of nominal voltage 12V, change the working voltage in the range of 11 V to 15 V and for that of 24 V, in the range of 22 V to 30 V. After this test, the speedometer shall satisfy requirements specified in 6.3.1.

7.2 Power Source Reverse Connecting Test

For speedometers for nominal voltage 12 V and 24 V,

connect the test voltage of 13 V and 26 V respectively with the reverse electrode for 1 min and examine for the existence of abnormalities.

After this test, the speedometer shall be tested as specified in 6.3.1.

7.3 Over Voltage Test

The over voltage test of speedometer shall either be done as per 7.3.1 or 7.3.2.

7.3.1 Over Voltage Test (Long Duration)

For speedometer of nominal voltage 12V, apply the test voltage of 18V and for of 24V apply 36V and after actuating for 1 h, examine for existence of abnormalities of each part.

7.3.2 Over Voltage Test (Short Duration)

For speedometer of nominal voltage 12V, apply the test voltage of 24V and for 24V apply 48V, for 1 min and there after examine for existence of abnormalities of each part.

7.4 Transient Voltage Test

The speedometer shall comply with the requirements of ISO 7637-2 and ISO 7637-3.

7.5 Electromagnetic Compatibility Test

As agreed to between the manufacturer and the purchaser, the electronic speedometer and odometer systems shall meet statutory electromagnetic compatibility requirements.

7.6 Insulation Resistance Test

Measure the insulation resistance between the case and conductor body in speedometer using a 500 V insulation resistance tester at room temperature and at normal humidity. The insulation resistance shall be at least 1 MΩ.

8 SENSOR UNITS TEST

8.0 In the case of electronic speedometer the signal is taken from the sensor unit. The sensor unit of speedometer shall comply with the requirement given in 8.1.

8.1 Performance Test with Sensor

8.1.1 The output wave form of sensor unit is to be checked to ascertain the quality of the output. If distributed input is given to the system, it shall affect the performance of the system. So the output wave form shall be free from any noise or ripples. Some of the output wave forms of sensors are given below:

Sl No.	Type	Output Wave Form
i)	Optical	Square (Amplitude shall not vary, only the frequency shall vary according to the speed)
ii)	Hall effect	Square (Amplitude shall not vary, only the frequency shall vary according to the speed)
iii)	Tacho generator	Sinusoidal (The frequency and amplitude will vary according to the speed)

NOTE — For tacho generator type the speedometer shall be designed to accommodate the maximum and minimum variation of the output.

8.1.2 Indication error shall be within permissible tolerance as specified in 6.3.1 when checked in combination with speedometer.

9 MARKING

9.1 The marking requirements shall be as specified in IS 11827.

9.2 BIS Certification Marking

The speedometers may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufactures or producers, may be obtained from the Bureau of Indian Standards.

ANNEX A

(Clause 6.1.1.1)

TESTS FOR TYPE APPROVAL

Sl No.	Tests (see 6.2 to 6.11)-Common to Mechanical and Electronics Type)	Sample Number													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
i)	Visual examination (see 6.2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ii)	Accuracy test (see 6.3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
iii)	Hysteresis test (see 6.4)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
iv)	Endurance test (see 6.5)	X	X												
v)	Vibration test (see 6.6)			X											
vi)	Dry heat test (see 6.7)				X										
vii)	Damp heat (cycling) test (see 6.8)					X									
viii)	Cold test (see 6.9)						X								
ix)	Rapid change of temperature test (see 6.10)							X							
x)	Driving rain test (see 6.11)								X						
xi)	Dust test (see 6.12)									X					
xii)	Electronic speedometer exclusive tests (see 7)														
xiii)	Temperature and voltage characteristic test (see 7.1)										X				
xiv)	Power source reverse connecting test (see 7.2)										X				
xv)	Over voltage test (see 7.3)											X			
xvi)	Transient voltage test (see 7.4)												X		
xvii)	Electromagnetic compatibility test (see 7.5)													X	
xviii)	Insulation resistance tests (see 7.6)														X
xix)	Sensor unit test (see 8)														
xx)	Performance test with sensor (see 8)	X	X												

NOTE — Sample to be tested (X).

ANNEX B

(Clause 6.1.2.1)

SAMPLING PROCEDURE FOR ACCEPTANCE TEST

B-1 LOT

B-1.1 In a consignment, all the speedometer and odometer systems of the same size, manufactured, from the same material under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 The number of speedometer and odometer systems to be selected from each lot shall depend upon the size of the lot and shall be as follows:

<i>Lot Size</i>	<i>Sample Size</i>	<i>Acceptance Number</i>
Up to 150	20	1
151 - 300	32	2
301 - 500	50	3
501 - 1000	80	4
1 001 - 3000	125	7
3 001 and above	200	10

B-1.2.1 The speedometer and odometer systems shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS 4905, shall be followed.

B-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

All the speedometer and odometer systems shall be selected at random in accordance with lot size and sample size as given in **B-1.2** and shall be subjected to the acceptance tests. A system failing to satisfy either of the requirements of acceptance tests shall be termed as 'defective'. The lot shall be considered as conforming to the requirements of acceptance tests, if the number of defective found in the sample is less than or equal to the corresponding acceptance number given in acceptance number in **B-1.2**, otherwise the lot shall be rejected.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: TED 11 (638).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones : 2323 0131, 2323 3375, 2323 9402

Website: www.bis.org.in

Regional Offices:

Telephones

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	{ 260 3843 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892

Branches: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.